

DETAILED ACTION

1. This Office Action is a response to the remarks filed on March 29, 2010. Claims 1, 2, 52 and 62 have been amended; no claims have been added or cancelled.
2. In view of the amendment(s) and remarks, the rejections of claims 2, 52 and 62 under 35 U.S.C. 112, 2nd paragraph and the rejections of claims 1, 2, 5-38, 52 and 57-62 under 35 U.S.C. 102(b) as being anticipated by Matyjaszewski et al. (EP 1 555 273 A1), or independently under 35 U.S.C. 102(b) as being anticipated by Matyjaszewski et al. (U.S. Patent 6,162,882) have been withdrawn.
3. Claims 1, 2, 5-52 and 57-62 are pending.

EXAMINER'S AMENDMENT

4. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Michael E. Dukes (Reg. No. 59,878) on June 15, 2010.

5. Claims 39-51 and 62 have been cancelled.
6. Claim 1 has been amended as follows:

Line 10: after the word "participate" insert the words --as an initiator or a catalyst--

7. Claim 52 has been amended as follows:

Line 10: after the word "participate" insert the words --as an initiator or a catalyst--

Allowable Subject Matter

8. Claims 1, 2, 5-38, 52 and 57-61 are allowed.

The following is examiner's statement of reasons for allowance: The present claims are allowable over the closest references: Matyjaszewski et al. (EP 1 555 273 A1), Matyjaszewski et al. (U.S. Patent 6,162,882) and Matyjaszewski et al. (U. S Patent Application Publication 2002/0128405).

Matyjaszewski'273 discloses improved processes for atom (or group) transfer radical polymerization (ATRP), which involve polymerizing in the presence of a (partially) free radical- deactivating amount of the corresponding reduces or oxidized transition metal compound. In a further improvement the ATRP process involves polymerizing in homogeneous system in the presence of a solubilized initiating/catalytic system (abstract).

Matyjaszewski'273 discloses a polymerization process comprising the process steps: polymerizing one or more radically polymerizable monomers in the presence of initiating system comprising: an initiator having a radically transferable atom or group, a transition metal compound which participates in a reversible redox cycle (i.e., with the initiator), an amount of the redox conjugate of the transition metal compound sufficient to deactivate at least some initially-formed radicals, and any N-, O-, P- or S- containing ligand which coordinates in a o-bond or any carbon-containing ligand which coordinates in a rr-bond to the transition metal, or any carbon-containing bond with said monomer under the polymerizing conditions, to form a (co)polymer, and isolating the formed

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(co)polymer; and, in part, by novel (co)polymers prepared by atom (or group) radical transfer polymerization 1 (pages 5-6, [0042]).

The molar proportion of transition metal compound relative to initiator is generally that which is effective to polymerize the selected monomer(s), but may be from 0.0001:1 to 10:1, preferably from 0.1:1 to 5:1, more preferably from 0.3:1 to 2:1, and most preferably from 0.9:1 to 1.1:1. Conducting the polymerization in a homogeneous system may permit reducing the concentration of transition metal and ligand such that the molar proportion of transition metal compound to initiator is as low as 0.0001:1, which is clearly within the claimed ranges as per claims 1,5-7, and 52 (page 16, [0110])

Matyjaszewski'882 discloses a process of atom (or group) transfer radical polymerization for the synthesis of novel homopolymer or a block or graft copolymer, optionally containing at least one polar group, with well defined molecular architecture and narrow polydispersity index, in the presence of an initiating system comprising (i) an initiator having a radically transferable atom or group, (ii) a transition metal compound, and (iii) a ligand,

Matyjaszewski'882 discloses the synthesis of a macromolecule having at least two halogen groups which can be used as a macroinitiator component (i) to subsequently form a block or graft copolymer by an atom or group transfer radical polymerization process, and a process of atom or group transfer radical polymerization for the synthesis of a branched or hyperbranched polymer (abstract). Another object is to provide a novel method for the synthesis of a macroinitiator for "living" radical polymerization and for the synthesis of a well defined block or graft copolymer where

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the macroinitiator constitutes at least one segment of the block copolymer (col. 5, lines 51-56). Accordingly, there is provided a method for atom (or group) transfer radical polymerization, encompassing the polymerization of a vinyl monomer in the presence of an initiating system, which includes: an initiator having a radically transferable atom or group, a transition metal compound, and a ligand; the polymerization forms a macroinitiator of formula (I):

(macromolecule)-(X)_n (I)

wherein each X is a halogen atom and n is an integer of 1 to 100; this macromonomer is then used in the presence of a vinyl monomer, a transition metal compound, and a ligand to form a block or graft copolymer, exhibiting a well defined molecular architecture (col. 6, lines 12-25).

Matyjaszewski'882 discloses that the molar ratio of the components (i), (ii) and (iii) of the initiating system may range from 1/0.01/0.02 to 1/4/12 (col. 12, lines 49-51)

When a solvent is used, suitable solvents include ethers, cyclic ethers, alkyl esters, aryl esters, C₁–C₁₀ alkanes, C₅–C₈ cycloalkanes which may be substituted with from 1 to 3 C₁–C₄ alkyl groups, aromatic hydrocarbon solvents, halogenated hydrocarbon solvents, acetonitrile, dimethylformamide, mixtures of such solvents, and supercritical solvents (such as CO₂, C₁–C₄ alkanes in which any H may be replaced with F, etc.). The present polymerization may also be conducted in accordance with known suspension, emulsion and precipitation polymerization processes (col. 13, lines 1-12; col. 13, line 32 through col. 17, line 67).

The method for making a hyperbranched molecule is illustrated in scheme 5. the activation-deactivation process is shown in the first step and is assumed to occur throughout the polymerization. Activation occurs prior to addition of a monomer unit and deactivation after monomer addition (col. 20, line 30 through col. 21, line 57).

Matyjaszewski'405 discloses catalysts for atom transfer radical polymerization processes. Specifically, a hybrid catalyst system comprising transition metal complexes held in close conjunction with a solid support and of a soluble ligand, or soluble transition metal complex or desorbed catalyst. The hybrid catalyst system may be used in a controlled polymerization process of radically (co)polymerizable monomers in the presence of a system comprising an initiator comprising one or more radically transferable atom(s) or group(s). The catalyst may include a transition metal, one or more counterions, a ligand attached to a solid support, and a soluble ligand. The hybrid catalyst may also be comprised of an attached transition metal complex, and a soluble transition metal complex. The ligand or the transition metal complex may be physico- or physicochemically or chemically bound to the surface of a solid support through ionic bonding, physisorption, chemisorption, Van der Waals forces, coordinate or covalent bonding. A process for the removal and recycle of a supported transition metal catalyst complex from a polymerization reaction medium is also described (abstract).

In a further option, one can add a low concentration of a reducing agent to reduce the concentration of the attached redox conjugate which would tend to increase due to unavoidable termination reactions. The reducing agent can comprise any species that reacts with a transition metal in its higher oxidation state and reduces it to a lower

oxidation state and can include sources of free radicals or a transition metal in a zero oxidation state (page 5, [0052]).

However, all three references of Matyjaszewski et al. do not disclose or fairly suggest a polymerization process, wherein the reducing agent is capable of reducing the at least one transition metal catalyst from an oxidized, inactive state to a reduced, active state, and particularly wherein the oxidized reduction product does not participate as an initiator or a catalyst in control of the polymerization process, as per newly amended claims 1 and 52.

Furthermore it is noted that claim 1 encompasses a direct process to reduce that transition metal catalyst from the oxidized, inactive state to the reduced, active state and claim 52 encompasses a direct and indirect process to reduce that transition metal catalyst from the oxidized, inactive state to the reduced, active state.

9. As of the date of this Notice of Allowability, the Examiner has not located or identified any reference that can be used singularly or in combination with another references including Matyjaszewski'273, Matyjaszewski'882 and Matyjaszewski'405 to render the present invention anticipated or obvious to one of ordinary skill in the art.

10. In the light of the above discussion, it is evident as to why the present claims are patentable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delay, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reason for Allowance".

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL M. BERNSHTEYN whose telephone number is (571)272-2411. The examiner can normally be reached on M-Th 8-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael M. Bernshteyn/
Examiner, Art Unit 1796

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/David Wu/
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